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Important note
To cite this publication, please use the final published version (if applicable).
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Conference Proceedings

BEHAVE 2023

the 7th European Conference on Behaviour Change for Energy Efficiency

Effectiveness of window signalling systems in open-plan workplaces: evidence from field work

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Keywords: Window, Feedback, Behaviour, Satisfaction, Indoor climate, Energy efficiency

Abstract

Occupants are often unaware of window-opening strategies that can enhance their well-being and reduce energy consumption. Window feedback systems that indicate when to manually operate a window have become a strategy for enhancing the indoor climate, occupant's satisfaction and energy efficiency. These systems are recognized for providing the comfort benefits of manual window controls while providing the efficiency benefits of completely automated windows (Bordass et al., 2007; Day et al., 2020). However, there is a lack of evidence to what extent window feedback systems are able to guide occupants towards an effective window operation for both energy and comfort.

This research proposes a new window feedback system based on indoor air quality, thermal quality and energy performance. Results from a preliminary testing and deployment are also presented to investigate the effectiveness of the light window feedback system. The outcome of the research shows that ambient light window feedback systems can improve the indoor environment and occupant's satisfaction in open-plan workplaces. Objective measurements reveal an improved indoor temperature, relative humidity and CO_2 concentration. Furthermore, it shows a reduced ineffective window opening time by 55%. Subjective measurements reveal that a majority of the respondents understand the system, do act according to the provided feedback and were satisfied with the implementation. The outcome of this research provides also design requirements for the further development of the light window feedback system and its algorithm.